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| ***TTF T013 - Final Report for ETSI*** | | | | | |
| **Presented to ETSI meeting** | MTS#85 |  | **Author:** | Dr. Philip Makedonski | |
|  |  |  | **Date:** | 22/12/2021 | |
| **Doc ref** | MTS(22)085010 |  | **Version** |  | |
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|  |  |  |  |  |  |
| **TTF** | **T013** |  | **TTF leader** | Dr. Philip Makedonski | |
| **TB/WG** | **MTS TDL** |  | **TB responsible** | Dr. Andreas Ulrich | |
|  |  |  | **Administrator** | Ms. Elodie Rouveroux | |
|  |  |  |  |  |  |
| **TTF title:** | TDL and TOP Enhancements for RESTful API Services Testing | | | | |
|  |  |  |  |  |  |
| **Milestone** | **D** |  | **Status** | **Covers the period until (cut-off date)** | 31/01/2022 |
| **Template** |
| **Objective** | Deliverables D1-D8 approved by TC MTS  Final report to be approved by TC MTS | | | | |
| **Achieved** | Yes |  | | | |
|  | | | |
| **Remarks** |  | | | | |
|  |  |  |  |  |  |
| **Achieved dates** |  |  |  |  |  |
| **Template** | **Draft report** | **TB approval** | **ETSI approval** |  |  |
| 22/12/2021 | 17/01/2022 |  |  |  |  |

# Executive summary

* This progress report covers the work of TTF T013 on reaching Milestone D, done in the period between 08-Mar-2021 and 31-Jan-2022. This period concludes the submission of the deliverables defined for Milestone D.
* TTF T013 continued the work of ETSI MTS on TDL and TOP adding new features and maintaining the existing TDL standards and their implementation within the TOP project.
* The work was done remotely with coordinated homework of the experts and technical discussions with the dedicated working group, which provided further technical guidance, with four working sessions organized to facilitate more intense and focused work on TDL during key periods in the preparation of the deliverables.
* The work of TTF T013 contributed to a booth presentation of TDL and TOP at the UCAAT 2021. Further dissemination activities have been performed by the experts and their respective organizations.
* The final deliverables have been submitted to the attention of TC MTS for approval after MTS#85 by remote consensus.

# Introduction

This progress report covers the entire work of TTF T013, done in the period between 08-Mar-2021 and 31-Jan-2022. This period concludes the submission of the deliverables defined for Milestone D. The work was done remotely by means of coordinated homework among the experts and technical discussions with the working group, which provided further technical guidance. Four coordinated remote working sessions were organized to facilitate more intense and focused work on TDL during key periods in the preparation of the deliverables.

## Scope, major aims of the TTF work

The ToR defines the final result of this TTF as the delivery of the final drafts of the multi-part ETSI standard ES 203 119 and the accompanying TR 103 119, comprising:

* ES 203 119-1 V1.6.1 Test Description Language; Meta-Model and Semantics

Scope: common concepts, meta-model, semantics

* ES 203 119-2 V1.5.1 Test Description Language; Graphical Syntax

Scope: TDL graphical concrete syntax for end users

* ES 203 119-3 V1.5.1 Test Description Language; Exchange Format

Scope: TDL exchange format for tool interoperability

* ES 203 119-4 V1.5.1 Test Description Language; Structured Test Objective Specification

Scope: TDL extension for structured test objectives

* ES 203 119-6 V1.3.1 Test Description Language; Mapping of TDL to TTCN-3

Scope: Mapping rules to automatically generate TTCN-3 test case skeletons from TDL test descriptions

* ES 203 119-7 V1.3.1 Test Description Language; Extended Test Configurations

Scope: Extensions to support the re-use of existing test configurations in TDL

* ES 203 119-8 V1.1.1 Test Description Language; Textual Syntax

Scope: TDL textual concrete syntax for end users

* TR 103 119 V1.2.1 Test Description Language; Reference Implementation and User Guidelines

Scope: Implementation and usage guidelines for the TOP project

## TTF activity and expected output

TTF T013 contributes to the work of TC MTS on the development of the “Test Description Language” (TDL), which acts as an intermediary between test purpose specification with TPLan and test case specification and implementation with TTCN-3. The TTF contributes to the ongoing activities in TC MTS to establish model-based testing (MBT) technologies within ETSI.

Building on the work of STF 454, 476, 492, 522, and 577, TTF T013 continues the development of TDL at ETSI MTS focusing on enhancements of TDL and TOP for RESTful API Services Testing as well as a standardised textual syntax for end users.

TTF T013 targeted maintaining and extending the existing standards, technical reports, and the tool implementations within TOP according to new and changing requirements as well as providing further information and guidelines to streamline the adoption of TDL in order to lower the barrier to entry for both users and tool vendors in adopting TDL. TTF T013 contributed to a presentation of TDL and the TOP at UCAAT 2021. TTF T013 also contributed to a presentation of TDL and the TOP at an ETSI Board SOOS meeting in May 2021.

Inquiries into the requirements for describing tests of AI systems and ML models with TDL did not provide sufficient input to progress on this topic. Future work may consider this subject again, once a clearer understanding of the user needs is available.

## Relation with the reference TB and with other bodies, inside and outside ETSI

Guiding the development of TDL within the TTF, the TC MTS set up a dedicated Working Group to review intermediate results and provide recommendations for further development. During the UCAAT 2021, feedback was gathered from various stakeholders inside and outside ETSI expressing interest in TDL. Several presentations by other stakeholders referenced TDL indicating general awareness and interest in TDL. The TDL working group organised three open working group meetings with stakeholders from other groups at ETSI as well as outside ETSI to gather feedback and user requirements.

# Overview of the organization of the activity

## Team composition and experts’ qualification

* Martti Käärik, OU Elvior, martti.kaarik[@elvior.com](mailto:finn@cinderella.dk):  
  Expert in TTCN-3, modelling, model-based testing, testing and test design tooling.
* Finn Kristoffersen, Cinderella Aps, finn@cinderella.dk:   
  Expert on TTCN-3, tooling implementation, testing.
* Philip Makedonski, Institut für Informatik, University of Göttingen, [makedonski@informatik.uni-goettingen.de](mailto:makedonski@informatik.uni-goettingen.de):  
  Expert on meta-modelling, tooling, language design, textual syntaxes.
* Konrad Schaupp, Adare GmbH, Konrad.schaupp@adare.de:   
  Expert on black-box testing, protocol definition, tooling implementation.

## TTF teamwork, distribution of tasks, working methods

* Martti Käärik:  
  Rapporteur for ES 203-119-1, ES 203-119-6, working on extension and maintenance of the TDL meta-model, the mapping of TDL to TTCN-3, the framework for the testing of RESTful API services with TDL, the graphical representation of TDL, as well as the maintenance of the graphical editor for TDL.
* Finn Kristoffersen:   
  Rapporteur for ES 203-119-2, working on extension and maintenance of the TDL-TO extension, the import of ASN.1 data specifications in TDL, and the reference implementation and user guidelines.
* Philip Makedonski:   
  STF leader, rapporteur for ES 203-119-3, ES 203-119-4, ES 203-119-7, ES 203-119-8, TR 103-119, working on extension and maintenance of the TDL meta-model, the graphical representation of TDL, the TDL-TO and TDL-TC extensions, the standardised textual syntax for TDL, the framework for the importing of ASN.1 and OpenAPI data specifications in TDL, the framework for the transformation of structured test objectives into test descriptions, and the reference implementation and user guidelines, as well as the maintenance of the textual editor for TDL.
* Konrad Schaupp:  
  Contributing to the import of ASN.1 and OpenAPI data specifications in TDL.

The main working method used in the TTF was group work. Sub-teams were created to prepare initial material for the individual tasks. Preliminary results from the work of the TTF team members were presented, discussed, and iteratively refined within the whole team. Conference calls were organised on a weekly basis to discuss progress and coordinate work on interdependent tasks.

## Liaison with the reference TB and/or the Steering Group

To guide the development of TDL within the TTF, a permanent Working Group (WG) has been set up with members from MTS. The WG reviewed the intermediate results from the TTF and gave recommendations for further development. There were four joint coordination meetings between the TTF and the WG, as well as other stakeholders:

* 2021-03-10, WG meeting with stakeholders to discuss the scope, tasks, and timeline
* 2021-05-19, WG meeting with stakeholders to discuss progress, and working solutions
* 2021-07-07, WG meeting with stakeholders to discuss progress, and working solutions
* 2021-07-14, WG meeting with stakeholders to discuss progress and future activities

Additionally, members of the TTF attended the MTS plenary meetings to present the progress of the work and discuss open questions.

## Meetings attended on behalf of the TTF with the reference TB and other ETSI TBs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Place** | **TB/Orga** | | **Event description** | **Reason to attend** | **Expert(s)** |
| 10-Mar-2021 | Online | MTS,  MTS-TDL | | TDL TTF Open Meeting | Discuss directions and wishes with different stakeholders | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 10-11-May-2021 | Online | | MTS | MTS#83, MTS-TDL#5 | Present and discuss achievements of the TTF up to that point | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 19-May-2021 | Online | MTS,  MTS-TDL | | TDL TTF Open Meeting | Discuss progress and wishes with different stakeholders | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 20-May-2021 | Online | | ETSI Board SOOS | BOARDSOOS#004 | Present and discuss the TOP project in the context of other OSS activities at and around ETSI | Philip Makedonski |
| 07-Jul-2021 | Online | MTS,  MTS-TDL | | TDL TTF Open Meeting | Discuss progress, potential directions for future TTF activities | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 14-Jul-2021 | Online | MTS,  MTS-TDL | | TDL TTF Open Meeting | Discuss directions for future TTF activities | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 28-29-Sept-2021 | Online | MTS | | MTS#84 | Present and discuss achievements of the TTF up to that point | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 19-21-Oct-2021 | Online | MTS,  ETSI,  Siemens | | UCAAT2021 | Presentation on TDL | Philip Makedonski,  Martti Käärik,  Finn Kristoffersen,  Konrad Schaupp |
| 18-19-Jan-2022 | Online | MTS, MTS-TDL | | MTS#85 | Present and discuss achievements of the TTF up to that point | Philip Makedonski,  Finn Kristoffersen,  Konrad Schaupp |
|  |  |  | |  |  |  |

## TTF communications, presentations, promotion, inside and outside ETSI, WEB pages etc

The following activities related to the communication, presentation, and promotion of the work of the TTF have been considered, planned, and/or performed:

* Members of the TTF have submitted a proposal for a presentation at the UCAAT 2021 to promote TDL and the work of the TTF. The proposal was accepted and members of the TTF prepared the corresponding materials for the presentation. Apart from the presentation by the TTF members, presentations by other stakeholders also referenced TDL, indicating general awareness and interest in the work of the TTF.
* An open meeting was setup by the MTS-TDL working group at the start of the TTF to discuss directions and wishes with different stakeholders.
* An open meeting was setup by the MTS-TDL working group to discuss progress and wishes with different stakeholders.
* Two open meetings were setup by the MTS-TDL working group to determine possible directions for future TTF activities with different stakeholders.
* The TTF leader presented a report on TOP to the ETSI Board SOOS group on 20-May-2021.
* An article by members of the MTS TST group referencing the work on TDL was published in Electronics Today at   
  <https://content.yudu.com/web/69r/0A170s5/ElectronicsNov21/html/index.html?page=20>
* Ongoing dissemination activities from TTF members from research institutions include raising awareness and promoting TDL on their respective websites and within teaching and research activities.
* A website for the TTF has been published on the ETSI portal.
* The official TDL website aggregating all resources related to TDL and its implementation is being updated and extended with new information. It is available at: <https://tdl.etsi.org>
* A dedicated project is established on the online issue reporting portal for ETSI (“ETSI’s Bug Tracker”) where change requests for TDL can be submitted and managed in an open and transparent manner. Change requests can be submitted at: <http://oldforge.etsi.org/mantis/view_all_bug_page.php>

# Final status of the activity

## Overview of the TTF work

The work of the STF resulted in the delivery of the Final Drafts of the multipart ES 203 119 "Methods for Testing and Specification (MTS); The Test Description Language (TDL);" as well as TR 103 119, including:

* ES 203 119-1 TDL Part 1: An adaptation and extension of the current TDL meta-model addressing the specification of test descriptions for RESTful APIs specified using OpenAPIs as well as change requests handed in from the TDL user community, including new features for data constraints as well as adaptations based on the needs for the standardised textual syntax.
* ES 203 119-2 TDL Part 2: An adaptation of the TDL graphical syntax according to the changes in Part 1, including change requests from users.
* ES 203 119-3 TDL Part 3: An adaptation of the TDL exchange format specification according to the changes in Part 1, including moving the schema to an electronic annex.
* ES 203 119-4 TDL Part 4: An adaptation and extension of the capabilities for structured test objective specification to include additional features, such as variants, that are in the interest of ETSI technical bodies and other users, as well as well as a standardised textual syntax.
* ES 203 119-6 TDL Part 6: An adaptation of the mapping from TDL to TTCN-3 according to the changes in Part 1.
* ES 203 119-7 TDL Part 7: An adaptation of the TDL Extended Test Configurations features according to changes in part 1, as well as well as a standardised textual syntax.
* Part 8: A revision and standardisation of the TDL textual syntax previously defined as informative annex Part 1, including change requests from users.
* Updated TOP tools together with an updated Technical Report documenting the available tools and their usage, as well as frameworks for the testing of RESTful API web services with TDL, the importing of external data specifications in ASN.1 and OpenAPI, and for the generation of test descriptions from structured test objectives.

## Technical risk, difficulties encountered and corrective actions taken

The progress of the work of the TTF may be negatively affected by the following risks:

**Task (inter-) dependencies may create bottlenecks for the work of the TTF**

Due to the parallel and distributed work on multiple deliverables across multiple experts, dependencies among individual activities may create hindrances for the progress of the TTF.

Severity: Medium, Likelihood: Low

Mitigation strategies:

* Limit dependencies between activities where possible.
* Make dependencies explicit where these are inevitable in order to raise awareness, as well as monitor and control potential implications.
* Ensure communication and collaboration among experts working on inter-dependent tasks.
* Reassign experts where applicable in order to accelerate progress of delayed activities and eliminate bottlenecks in a timely manner.

**Misunderstandings and communication barriers hinder progress**

Misunderstandings and communication issues during discussions and individual work may negatively impact the progress of the TTF work.

Severity: Medium, Likelihood: Medium

Mitigation strategies:

* Moderation and awareness – recognize and differentiate between misunderstandings, where clarification is needed, and technical disagreements, where different solutions are proposed.
* Emphasis on facts, substantiated and illustrated with examples, and written input and output of discussions, which describes ideas, problems, and solutions in sufficient detail, and can be referenced to in subsequent discussions.
* Identify fundamental differences in alternative proposals and their impact in order to establish a baseline for discussions, rather focusing discussions on superficial and non-essential differences.
* Communicate and resolve persistent issues and disagreements with the help of the steering group.

**Misalignment of expectations towards the TTF and the output of the TTF**

Due to potentially unrealistic or misaligned expectations towards the TTF from different stakeholders, the output of the TTF may not be able to meet these expectations.

Severity: Medium, Likelihood: Medium

Mitigation strategies:

* A steering group has been established to provide technical guidance and mediate technical disagreements.
* Frequent reporting and technical discussions with the steering group and TC MTS ensure that the work of the TTF is aligned with its expectations. The TTF has an opportunity to communicate any expectations that are perceived to be unrealistic back to the steering group and TC MTS.
* Concrete examples are prepared to support technical discussions and ensure alignment of expectations

**Complex technological landscape may slow down progress on TOP maintenance**

Due to the complex and constantly evolving technological landscape surrounding the platform on which the TOP is based, unforeseen challenges may slow down the progress of the TTF. Conversely, unforeseen benefits may also speed up the progress of the TTF.

Severity: Medium, Likelihood: Medium

Mitigation strategies:

* Limiting the dependencies on third-party components.
* Keeping up with the latest developments so that maintenance is performed in smaller increments as the risks tend to increase with time.

## Lessons learnt

Based on the experiences with the TTF and especially with respect to the identified the following observations and recommendations can be made:

* Dependencies among tasks can prove to be critical to the progress of the work. Delays with tasks on which other activities depend can negatively impact the progress and the quality of the work. It is recommended that important dependencies between tasks are formally taken into account during TTF milestone planning and put right into the Terms of Reference.
* Expectations towards the output of the TTF need to be kept in alignment the WG and other stakeholders in a timely manner. Issues raised late put unnecessary pressure on all parties involved and there may be no resources left to address them properly.
* It may be reasonable to explore new features through TOP first in the future, so that they can be delivered to users early on and the users can report back to the TTF before the features are standardized.

## Recommendations for future activities in related domains

Based on the experiences with the TTF and especially with respect to the identified the following observations and recommendations can be made:

* It may be reasonable to explore new features through TOP first in the future, so that they can be delivered to users early on and the users can report back to the TTF before the features are standardized.
* Means for supporting the validation of complex interrelations between the various components in the TDL specifications and their implementation shall be explored and employed to reduce the risk of inconsistencies, and the overall overhead of maintenance in the future.
* Web-based working environments are becoming more and more wide-spread, making sure that the tools from the TOP project are available in a web-based working environment is an important step forward to help ensure wider adoption of TDL and facilitate integration with other platforms such as the New Working Methods (NWM) platform at ETSI.

# ETSI deliverables

|  |  |
| --- | --- |
| Deliverable: RES/MTS-TDL-203119-1v1.6.1 (ES 203 119-1)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS); Test Description Language (TDL); Meta-Model and Semantics | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft | 2021-05-03 |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: DES/MTS-TDL-203119-2v1.5.1 (ES 203 119-2)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS); Test Description Language (TDL); Graphical Syntax | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft | 2021-05-03 |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: DES/MTS-TDL-203119-3v1.5.1 (ES 203 119-3)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS); Test Description Language (TDL); Exchange Format | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft |  |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: DES/MTS- TDL-203119-4v1.5.1 (ES 203 119-4)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS) Test Description Language (TDL); Extensions: Structured Test Objective Specification | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft | 2021-05-03 |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: DES/MTS- TDL-203119-6v1.3.1 (ES 203 119-6)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS) Test Description Language (TDL); Mapping to TTCN-3 | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft |  |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: DES/MTS-TDL-203119-7v1.3.1 (ES 203 119-7)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS) Test Description Language (TDL); Extensions: Extended Test Configurations | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft |  |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: RTR/MTS-TDL-203119-8v1.1.1 (ES 203 119-8)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS) Test Description Language (TDL); Textual Syntax | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft |  |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
| Deliverable: RTR/MTS-TDL-103119v1.2.1 (TR 103 119)  Current status: Final draft for approval  Working title: Methods for Testing and Specification (MTS) Test Description Language (TDL): Reference Implementation | **Achieved date** |
| Creation of WI by WG/TB | 2020-08-13 |
| TB adoption of WI | 2020-08-31 |
| Start of work | 2021-03-08 |
| Early draft |  |
| Stable draft | 2021-09-22 |
| Final draft for approval | 2022-01-17 |
| TB approval | RC |
| Draft receipt by ETSI Secretariat |  |
| Publication |  |
|  |  |

1. Performance indicators
   1. Performance Indicators objectives achieved

The work of the TTF had an impact on the performance indicators agreed within the ToR in the following way:

**Interests of ETSI and non-ETSI stakeholders**

* **Voluntary work of experts directly involved in the TTF or outside the STF:**Experts spent additional resources on a voluntary basis in order to ensure the progress and promotion of the work and address issues that need further clarification or input from external stakeholders. Additionally experts from MTS participated in the Working Group for this TTF.
* **Presentations to other ETSI TBs:**There were no formal presentations of the TTF given to other TBs. A presentation was given to the Board SOOS group on experiences with the TOP project. Additionally, the specific requirements of potential users of TDL, such as 3GPP, ITS and oneM2M, were discussed on an informal basis. The open WG meetings further helped to involve other stakeholders at ETSI and beyond in the work of the TTF.
* **Contributions received from other ETSI TBs:**The TTF analysed contributions in terms of technical specifications from SET, 3GPP RAN5, IMS, IPv6, ITS, oneM2M and others as input to the work on TDL and TOP.
* **Contributions presented to TB MTS meetings:**The TTF reported its progress regularly to MTS and also to the WG and discussed acute issues.
* **Presentations in workshops, conferences, stakeholder meetings (outside ETSI):**Members of the TTF gave a presentation at the UCAAT 2021 to promote TDL and the work of the TTF.
* **Comments received on drafts (e.g. from personal communication, mailing lists, etc.):**There was an extensive exchange of ideas, recommendations etc. between the TTF and the MTS-TDL WG.
* **Potential interest of new members to join ETSI:**The work of MTS in general is attractive also outside of ETSI, multiple participants at the ETSI UCAAT 2021 expressed interest in contributing towards the work of MTS in general and the work on TDL in particular during discussions at the event.
* **Liaison to identify requirements and raise awareness on ETSI deliverables:**Informal discussions with interested stakeholders and related projects and activities of the TTF members have contributed to raising awareness about the work on TDL.
  1. Performance Indicators objectives not achieved

This section does not apply since all performance indicators were achieved at various levels.

1. Resources allocated and spent

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author:** | **ETSI - Funded Activities** | |  |  |  |
| **Period covered:** | **From: 08/03/2021** | **To: 31/01/2022** | |  |  |
| **Status:** | **Final** |  |  |  |  |
| **Status date:** | **22/12/2021** |  |  |  |  |

* 1. Summary of resources allocated and spent (real cost)

|  |
| --- |
|  |

These have been divided into Manpower and travel budgets. The total expenses are summarized in the table below.

Table 1: Summary of resources spent

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **Expertise Service Provision** | **Travel** | **Total** |
| Resource Available | | 102 600,00€ | 6 000,00€ | 108 600,00€ |
| Resource Usage | | 102 600,00€ | 0,00€ | 102 600,00€ |
| **Variance (Avail. - Usage)** | | 0,00€ | 6 000,00€ | 6 000,00€ |

Table 2: Travels

Total Travels: 0,00 €.

No Travels have been done.

|  |
| --- |
|  |